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Leaders: Ebbe Munck and Eigil Knuth

REMARKS ON THE MAP AND THE GEOLOGY OF KRONPRINS CHRISTIANS LAND

BY

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WITH 9 FIGURES IN THE TEXT AND 1 MAP

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PREFACE

The present work deals with some observations made on my journeys as a member of EIGIL KNUTH's and EBBE MUNCK's expedition to Northeast Greenland in 1938—39.

It is a pleasure to me to express my thanks to the leaders of the expedition for the opportunity afforded me for working within an area of Greenland which I had desired to visit for several years.

For good companionship during the winter I wish to thank Count EIGIL KNUTH, the leader of the wintering party, Dr. phil. PAUL GELTING, cand. polyt. SVEND SØLVER, and the radio operator KURT BÆK. I likewise thank the Greenlanders ELI KRISTIANSEN and ZACHÆUS SANDGREN, and more especially OVE ROSBAK, my excellent travelling companion on all longer and shorter journeys. To ELMER DRASTRUP and EIGIL KNUTH I am indebted for good cooperation during the preparation of the map accompanying the present paper.

To Docent J. P. J. RAVN and Docent Dr. phil. CHR. POULSEN I owe thanks for the great readiness with which they undertook an examination of parts of the material collected.

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To my former chief, Dr. phil. LAUGE KOCH, I tender cordial thanks for valuable information forwarded to me during my stay in Greenland and for helpful assistance after my return home.

INTRODUCTION

On a long sledge journey through regions so unknown, geologically, as northeastern Greenland it is no easy matter to limit oneself to a single main task. One cannot avoid making observations in fields which are perhaps somewhat remote from one's interests, and to which, therefore, only as little as possible of the always sparsely allotted time can be devoted. In an area so difficult of access as Northeast Greenland reconnaissances of this kind are of indisputable importance, partly because they may serve as an orientation for later expeditions and show what objects will require specialists, and partly because even scattered observations may, of course, supply facts of importance for the elucidation of the geological history of such an area in its broad features.

To show the importance of such reconnaissances for the arrangements of later great expeditions it will suffice to mention LAUGE KOCH's summer expeditions in 1929 and 1930, preceding the large Three-Year Expedition in 1931—34; it is true that much which was observed during these two summers was not maintained after more thorough investigations had been made; still they were of value, for they formed the foundation of the later more extensive plan of investigation.

The observations dealt with in the present paper were made on a sledge journey from Dove Bugt to Wandels Hav in the spring of 1939. The main object of my journey was to investigate the late-Palæozoic marine sediments found between 80° and 81° N. lat. and, if possible, the corresponding sediments in eastern Peary Land.

The marine sediments between 80° and 81° N. lat. were discovered by the Danmark Expedition on the long spring journey in 1907. Some material was brought home, but it was mostly derived from loose blocks, and our knowledge of the stratigraphy of this sediment area therefore remained deficient up to the present day.

The late-Palæozoic sediments on Peary Land were discovered by LAUGE KOCH in 1921 (LAUGE KOCH 1926, p. 87; 1929a, p. 93; 1929b, p. 245), but owing to subsequent difficult travelling conditions the collections were not brought home.

The course of my journey was roughly as follows: After investigating the sediments on Holms Land, I travelled westward up through Ingolfs Fjord in order to try to reach Peary Land by way of Kronprins Christians Land and Danmarks Fjord. It soon proved impossible to reach Danmarks Fjord by that route, so I drove out of Ingolfs Fjord again in order to explore Amdrups Land. From Amdrups Land I continued northward via Nordostrundingen to our northernmost point a short day's journey west of Nakkehoved. Very deep snow in connection with the advanced date (May 18th) contributed to my decision to postpone the trip to Peary Land till a later year, although I was abundantly equipped in every respect, and the dogs were in excellent condition.

During the journey inland through Ingolfs Fjord and across the land behind it, a land area never before visited by any expedition was passed between 17° and 22° W. long. Here a number of geographical and geological observations were made. These observations in connection with others made at Nakkehoved and scattered observations of different kinds in the remaining part of the area traversed by me I have collected in the present work, because they will not fit in naturally in a paper to be published later dealing with the stratigraphy of the late-Palæozoic sediments, the investigation of which was the actual object of the journey.

REMARKS ON THE MAP

The map of the area between 11° and 22° W. long. and 80° and 82° N. lat. accompanying the present paper has been compiled on the basis of the previously existing maps of the area, the most important of which are the map of the Danmark Expedition and LAUGE KOCH's map. The part of the map of the Danmark Expedition employed here was for the most part surveyed on the spring journey in 1907 by the two main travelling parties under the leadership of L. MYLIUS-ERICHSEN and J. P. KOCH respectively; Ingolfs Fjord and Dijmphna Sund were mapped on the same journey by the WEGENER-THOSTRUP supporting sledge party. LAUGE KOCH's map (KOCH 1935b, Fig. 2) contains many new details, especially from the interior of Kronprins Christians Land. The material for the map was secured on two long flights in the summer of 1933.

With these maps as a basis the new observations from the western part of Ingolfs Fjord and the country around the western end of the fjord as well as a number of minor corrections of several of the details of the map have been inserted.

From the preceding years' work in more southerly parts of East Greenland I knew how much the geological mapping work was facilitated when the new, very reliable map sheets were gradually placed at our disposal. On heading westward through Ingolfs Fjord from the outer coast in 1939 I still believed that the earlier maps of this part of Greenland would prove to be quite sufficiently detailed to form a basis for my geological observations. However, it soon became apparent that the shape of the fjord deviated so considerably from the earlier maps that it would be necessary to prepare a new map of it.

On the map of the Danmark Expedition the head of Ingolfs Fjord is marked in about 18° W. long.; but part of the coast-line bounding the western part of the fjord is not full-drawn. As compared with this map, on KOCH's map the fjord continues due westward, in continuation of a large valley which extends far into Kronprins Christians Land. This valley is joined by a branch valley from the north, in which the very large Romers Sø is situated. On planning my journey on the basis

of these maps, it was my intention to travel from the head of Ingolfs Fjord westward through the large valley, and having covered some distance of the valley to travel northward up through the valley to Romers Sø, whence, according to KOCH's map, it would hardly be very difficult to reach the coast somewhere in the northwestern part of Kronprins Christians Land.

As long as I was driving westward in the broad part of Ingolfs Fjord east of 18° W. long., it was impossible to see whether the fjord continued farther westward than indicated on the map of the Danmark Expedition; it was not till I had almost reached the place where the fjord narrows very much that I discovered that the shape of the fjord differed considerably from that indicated both in the map of the Danmark Expedition and in KOCH's map.

During my journey inward through the fjord I did not fully realise how great the difference was, and I therefore continued inland through Sødalen, according to my plan, as I still expected that I should have to travel some distance inland before turning northward into the valley leading to Romers Sø.

As my westward advance was impeded by obstacles presented by the terrain, I commenced taking observations from a number of stations around Sødalen in order to draw a sketch-map of the area traversed. During this work, which was continued during the journey out through the narrow part of the fjord, I realised that the fjord extended so far westward that the valley in which Romers Sø is situated debouches into the fjord itself and not into Sødalen.

At this time a reconnaissance towards Romers Sø was for several reasons more difficult to carry out, nor was it any longer of great interest; I therefore continued the mapping, proceeding out through the narrow part of Ingolfs Fjord.

Having almost got back to the western part of the fjord area mapped by the Danmark Expedition, I unexpectedly met DRASTRUP and CHRISTOFFERSEN, the two members of the expedition led by DRASTRUP; the object of their expedition was to travel around the north of Greenland to Thule. After encountering obstacles near Kap Jungersen during their attempt to travel along the outer coast around Nordostrundingen, they had made up their mind to try the route through Ingolfs Fjord and across Kronprins Christians Land. After a brief discussion of my observations we parted again, DRASTRUP heading westward, my party eastward.

From the innermost part of Ingolfs Fjord DRASTRUP's expedition drove northward through Vandredalen and the southern part of Romers Sø; later on they travelled southward from the inner part of Ingolfs Fjord to Hekla Sund. DRASTRUP, too, did mapping work in Ingolfs Fjord and

north and south of it; DRASTRUP's mapping extends to areas not visited by me, as for instance Vandredalen and the stretch around his travelling route from Ingolfs Fjord to Hekla Sund. After our return to Denmark both DRASTRUP's and my observations were used in the preparation of the sketch-map accompanying the present paper; in the construction of the map an attempt has been made to combine our observations with previous observations in a usefull sketch-map.

Thus the map has been compiled chiefly from the observations made by the Danmark Expedition, by LAUGE KOCH, and by ourselves, and prepared with the cooperation of KNUTH, DRASTRUP, and the present author. The mapping in 1939 was done with the compass as the sole instrument, and cannot therefore claim to be anything like as accurate as for instance the coast contours on the map of the Danmark Expedition. As regards the part of the map which is based on KOCH's observations, I shall quote a few lines from the paper in which his map is published. KOCH says (KOCH 1935b, p. 609): "Naturally, however, a great part of the mapping done on such a flight must be free-hand drawing, so the map cannot be published on too large a scale, although during my earlier flights I had acquired a fairly good training in this kind of mapping." For the sake of completeness it may be in place to mention that on his journey from Dove Bugt across the inland ice to Danmarks Fjord EJNAR MIKKELSEN observed certain details in Kronprins Christians Land (EJNAR MIKKELSEN 1922, Pl. III), but these observations were made from a great distance, and it is difficult to combine them with the other maps.

During the combination of the maps we repeatedly had to choose between features shown differently in the map of the Danmark Expedition and LAUGE KOCH's map for areas which were not visited in 1939. In such cases the delineation held by us to be the most probable was chosen. For in order to get a general idea of the geology it was desirable to mark on the map the peninsula between Danmarks Fjord and the outer coast as far as it has been done.

Of the principles applied in combining the maps I may mention that the coast-lines have in the main been taken from the map of the Danmark Expedition except in the northwestern part of the area, where they have been copied from KOCH's map. The ice-caps on Holms Land and Amdrups Land are no doubt most correct on KOCH's map; but although our observations were made in the winter of a year with much snow, when it was often difficult to distinguish the accurate boundaries of the ice-caps, we have made a couple of minor corrections. The ice-caps in the interior of Kronprins Christians Land and the nunatak system east of Romers Sø, so important for the geological picture, are indicated according to KOCH's map.

As regards the difference in the shape of Ingolfs Fjord as marked on the map of the Danmark Expedition, on KOCH's map, and on the new map, the following comments will be in place. The THOSTRUP-WEGENER party which on the Danmark Expedition was entrusted with the task of mapping Ingolfs Fjord, did not push farther towards the interior of the fjord than to the westernmost island of the small group called Wegener Øer on the new map. From their observation cairn on this island (I had the opportunity of ascertaining this myself) it is impossible to see the interior of the fjord beyond 18° W. long., which explains the shape of Ingolfs Fjord on the map of the Danmark Expedition.

The prolonged fjord on KOCH's map has a shape which differs considerably from that of the new map, but in both maps the western portion of the fjord is divided into two small branches. This would seem to indicate that KOCH has seen the western end of the fjord from the air without noticing its connection with the outer fjord.

As will appear from the map, my observations show the following features in the interior of Ingolfs Fjord. At the point where the fjord ends on the map of the Danmark Expedition, it is closed by a large glacier coming from the south, whose tongue extends across the fjord; on the east side of this glacier a small island is situated in the middle of the fjord; this island is a remnant of a resistant dark rock band, whose continuation is seen in the steep mountain walls on either side of the fjord. The northern part of the glacier tongue floats on the fjord, and it seems to be the threshold formed by the aforementioned rock band on the bottom of the fjord which prevents the much crushed glacier tongue from drifting out into the outer fjord in the form of icebergs. West of the glacier the narrow fjord continues through the markedly alpine mountain range whose easternmost peaks are already indicated on the map of the Danmark Expedition. After cutting through this mountain range at right angles to its longitudinal direction, the fjord bends towards the southwest. It continues in this direction for some distance along the west side of the alpine range, from which a number of magnificent glaciers descend to the immediate neighbourhood of the shore. Farthest to the southwestward the fjord ends in two small branches, as stated above. The interior of the fjord is occupied by numerous bergs, originating especially from Spærregletscher, Hjørnegletscher, and a small unnamed glacier issuing from the north and debouching into the fjord immediately west of Spærregletscher. These bergs have no possibility of drifting out into the broad outer fjord.

At the head of the northwestern terminal branch of Ingolfs Fjord a river opens out from the west, but some distance farther west its main course turns towards the southwest; it is this river which drains the large lake indicated on KOCH's map between Sjællands

Fjældene and Skallingen. From an altitude of about 1000 m I looked down across this river valley (Fig. 5) and saw the beginning of a lake, Troldsøen, whose situation agrees fairly well with the northeastern end of KOCH's long lake; on account of the somewhat winding course of the valley I was unable to decide whether it contained one lake or a series of lakes.

A very large valley extends in a northerly direction from the innermost part of the northwestern branch of Ingolfs Fjord. DRASTRUP's journey confirmed my supposition that this valley leads northward to the large Romers Sø shown on KOCH's map.

Since both DRASTRUP's and my sketch-maps of the interior of Ingolfs Fjord were drawn without any more accurate measurements than compass bearings, it was hardly surprising that they differed somewhat from each other in several respects. The greatest difference was that on DRASTRUP's sketch-map the inner part of the fjord extended some distance farther westward than on mine. On the final map, an adaptation of the two maps drawn independently of each other, the fjord is therefore somewhat longer than my observations show it to be. This adaptation is mentioned here in order to show the sketchy nature of the map.

On another point, too, an adaptation has been attempted, viz. in connecting the numerous glacier tongues observed from my sledge in Ingolfs Fjord with the glaciers and ice-caps observed by KOCH from an airplane in the large alpine ranges Prinsesse Caroline-Mathildes Alper and Prinsesse Elisabeths Alper. This connecting up of the ice-caps with the glacier tongues observed has merely been done in order to convey a correct impression of the general picture of the highly alpine mountain tracts.

The various minor alterations in other parts of the map hardly require special mention.

The Names of the Map.

A number of new place names have been given by KNUTH's, DRASTRUP's, and my sledge parties during the journeys in 1939. For my own part I have attempted to limit the number of place names within my working field to what was absolutely necessary for the geological description; still it was necessary, because of the many geological sections measured, to introduce a fairly considerable number of names.

On the place names of importance for the geological orientation I may make the following comments.

The name Mallemukfjæld, known from the Danmark Expedition, is here applied to the eastern, most precipitous part of the series of

steep coastal mountains (Fig. 7) which extend from the southeastern point of Holms Land along the north side of Dijmphna Sund. Mallemukfjæld is cut across by a small glacier, Mallemukgletscher. To the west Mallemukfjæld is bounded by another small glacier, Depotgletscher. The mountain area, of quite different appearance, west of Depotgletscher, to which the name Mallemukfjæld was also sometimes applied by the Danmark Expedition, and at the coast of which one of its depots was established, is here denoted Depotfjæld. West of Depotfjæld there follow some darker, somewhat lower coastal mountains, Sortebakkerne, consisting of continental Carboniferous deposits with many seams of excellent coal.

The mountain at the northeastern point of Holms Land has been called Maagefjæld, as a pendant to Mallemukfjæld, and a large productive glacier immediately west of the mountain received the name Maagegletscher.

The low valley separating Holms Land proper from the alpine landscape to the west was called Firndalen on account of the large ice-caps or firns surrounding it. This valley is practicable as a sledge route between Dijmphna Sund and Ingolfs Fjord. A continuation of this valley north of Ingolfs Fjord, which in a similar manner separates Amdrups Land proper from the alpine land to the west, has been called Bagdalen. As far as I could make out, Bagdalen forms a passable sledge route between Ingolfs Fjord and Antarctics Bugt.

The small group of islands in Ingolfs Fjord reached by the THOSTRUP-WEGENER party has been named after ALFRED WEGENER. The magnificent alpine range between Ingolfs Fjord and Dijmphna Sund received the name Prinsesse Caroline-Mathildes Alper, and its continuation north of Ingolfs Fjord Prinsesse Elisabeths Alper. The mountain range west of the southwestward directed part of Ingolfs Fjord has been called Taagefjældene, and the large glacier situated between the latter and Prinsesse Elisabeths Alper was called Hjørnegletscher.

The glacier which from Prinsesse Caroline-Mathildes Alper issues across the eastern part of the narrow inner part of Ingolfs Fjord was called Spærregletscher, and the splendid hanging glacier situated farthest north on the eastern side of the southwestward directed part of Ingolfs Fjord received the name Draabegletscher (see Fig. 2).

Næsen is the name of the mountain lying between the two small innermost branches of Ingolfs Fjord, and Sødalen is the large valley which extends across Kronprins Christians Land in continuation of the northernmost of these two fjord branches. The easternmost mountain on the south side of Sødalen was called Portfjældet, and on the north side the mountains from east to west were named Nøglefjældet, Profilfjældet, Vestfjældet, and Palisaderne. The large lake occupying Sødalen,

or, if there are several lakes, the northeasternmost of them, was called Troldsøen.

The long strip of land extending into Flade Isblink from the area between Antarctics Bugt and Nordostrundingen is termed Kilen.

Some distance west of Nakkehoved I came upon a low stretch of land which issues a small cape into Wandels Hav, and a small island lies in front of it. The cape has been named after the protector of the expedition, His Royal Highness Prins KNUD. Possibly it is this land which EJNAR MIKKELSEN mentions in the report on his journey (EJNAR MIKKELSEN 1922, p. 109), and which he took to be a flat nunatak. I traversed this area in driving snow and a thick fog from the open sea near by, and I was therefore unable to determine its position by taking bearings to Nakkehoved, but had to estimate the distance merely from the time which the journey took.

For the remaining new names on the map the reader is referred to the forthcoming papers by KNUTH and DRASTRUP.

On the open water along the northeasternmost part of Greenland in the winter of 1938—39.

As is well known from earlier travelling reports, the land-fast winter ice off East Greenland between c. 80° N. lat. and Nordostrundingen lies as a much narrower belt along the outer coast in the winter than is the case south of this area. LAUGE KOCH (1935b, p. 616) has pointed out that the open water which according to earlier and his own observations seems to be a frequent phenomenon along this coast, is the cause of the heavy glaciation of the areas of northeastern Greenland which are situated nearest to the coast. On the accompanying map I have marked the approximate position of the boundary of the land-ice in 1939 on the basis of observations made in April and May. As will be seen, in 1939 there was no land-ice at all off the greater part of the east coast of Amdrups Land, and a zone only a few kilometers broad was found along the remaining part of the outer coast north of Hovgaards Ø. Both in Dijmphna Sund and in Ingolfs Fjord it could be observed that at an earlier date of the winter the ice had been broken up over a considerable area in the mouth of the fjords. Here the ice-covering in April consisted partly of new ice and partly of floes of somewhat thicker ice connected by new ice. The most surprising observation, however, was that north of Nordostrundingen also the open water extended quite close to the shore, at any rate as far as 30 km west of the western point of Nakkehoved.

Whenever the visibility allowed observations to be made, even north of Nakkehoved, only extremely scattered floes ("Storis") were seen in the open sea.

Even though icebergs of such large dimensions as those found for instance in Scoresby Sund are never observed in this part of Greenland, a surprisingly large number of productive glaciers are found here. Flade Isblink produces small icebergs along almost the whole stretch from Nordostrundingen to the inner part of Antarctics Bugt, and along a great part of the "Isblink" a number of these bergs have run aground some distance from the glacier's edge. The edge of the glacier towards Antarctics Bugt is in such strong movement during the winter that the sea-ice of the bay is full of crevasses several kilometres in length which greatly impede sledging. Maagegletscher produces icebergs of a height of up to 20 m, and both Spærregletscher, Hjørnegletscher, and one more glacier produce bergs which never make their way out of the inner part of Ingolfs Fjord. Several of the steep glaciers in the interior of Ingolfs Fjord are productive, too, among others the hanging glacier Draabegletscher, whose tongue at intervals breaks off in the form of larger or smaller ice-blocks which crash down the mountain slopes and may even fall down into the fjord; the largest of these ice blocks have a weight of several hundred tons.

In the outer part of Dijmphna Sund the largest icebergs of the whole area were observed. To all appearance they must be derived from one or several of the glaciers in the inner part of this sound or Hekla Sund, which I had no opportunity of visiting. It is true that both Mallemukgletscher and Depotgletscher are productive, but both of them on a very small scale.

REMARKS ON THE GEOLOGY

Observations made on a journey from the mouth of Ingolfs Fjord to the central part of Kronprins Christians Land.

Only two sledge expeditions have previously visited the land between Danmarks Fjord and the east coast of Greenland, viz. the Danmark Expedition in 1907 and the Alabama Expedition in 1910. None of them were at work in the interior of the country, but both made investigations and collections in the coastal areas.

The collections of the Danmark Expedition were worked up by Professor NATHORST and Professor GRØNWALL respectively; they established the presence of continental and marine Carboniferous deposits in the land nearest the outer coast between 80° and 81° N. lat.

J. P. KOCH and A. WEGENER, members of the Danmark Expedition measured three small sections on the south side of Holms Land, and later on WEGENER alone made investigations on Amdrups Land, Henrik Krøyers Holme, and the coasts of Dijmphna Sund. The individual sections measured and the material collected, which was derived to a great extent from loose blocks, according to GRØNWALL were too incomplete to work out even a fairly detailed stratigraphical table.

According to JARNER's compilation of J. P. KOCH's and A. WEGENER's observations, the conditions were as follows: "The carboniferous deposits occur on the coast outside the Archæan rocks. They here form a plateau, the height of which at the outer coast measures about 500 meters, while it is somewhat lower inwards in consequence of the gentle slope of its surface to the westward. The Archæan rocks west of the carboniferous deposits rise to their usual height of about 1000 meters" (GRØNWALL 1911, pp. 339—40).

On his journey southward along the outer coast in 1910 EJNAR MIKKELSEN was forced to stay in this very area for several weeks, but under the exceedingly difficult circumstances under which his journey was made, it was of course impossible to bring back any collections. EJNAR MIKKELSEN carried samples of great interest from the area west of Danmarks Fjord, but unfortunately lost them during the last part of the journey.

EJNAR MIKKELSEN's expedition was the last expedition for a number of years which visited the northeastern part of Greenland, and it was the last sledge expedition to these regions prior to "The Danish Northeast Greenland Expedition 1938—39".

The increased knowledge of the geology of the interior of Kronprins Christians Land which we have obtained in the last few years before the start of our expedition is due to the two long reconnaissance flights made in the summer of 1933 by LAUGE KOCH (LAUGE KOCH 1935a, 1935b, and 1936).

In these papers KOCH roughly outlines the geological development of this area, which up to that time was largely to be considered a "terra incognita" in a geological respect. His description may be summarised as follows.

West of a line extending from the western part of Nakkehoved in a south-southwesterly direction across the land behind Ingolfs Fjord and Dijmphna Sund there occur unfolded or very slightly folded sediments of considerable thickness. The sediments consist of dark shales, which nearest Danmarks Fjord are underlain by the deep-red sandstones of the Thule Formation penetrated by diabase.

East of the line there occurs an alpine mountain range, whose northernmost offshoot is Nakkehoved, whence it extends southwards across Grenen, the area around the inner part of Ingolfs Fjord, and the western part of Holms Land, Hovgaards Ø, and Lamberts Land. Farther south the direct continuation of the range is formed by the nunataks of Dronning Louises Land, and the nunatak areas around Petermanns Bjærg and behind the Scoresby Sund complex. The mountain range is chiefly built up of a strongly folded limestone-dolomite series which forms the direct continuation of the rocks of the Petermann Series.

Along the outer coast, east of the range, we find a zone of gneissified sediments and granites, which on Amdrups Land and Holms Land are overlain by late-Palæozoic sediments.

In his interpretation of the observations summarised above KOCH makes a comparison with the conditions found in more southerly parts of East Greenland, saying as follows (KOCH 1935a, p. 11): "Man hat also mit einer Schichtserie zu tun, die aus ausgeprägten Thule-Formationsgliedern besteht, die im Westen Mylius-Erichsen-Land aufbauen, weiter im zentralen Teil von Kronprins Christians Land mit Schiefern, die die Thule-Formation überlagern, und schliesslich, am weitesten nach Osten, in der Fjordregion, mit Kalken und Dolomiten. Die Ähnlichkeit mit der Eleonore-Bay-Formation, so wie sie von der Gegend um den König Oscar-Fjord in ihrem vollem Ausmass bekannt ist, ist in allen Teilen auffallend. Hier findet man zuunterst eine Quarzitserie, darüber eine Schieferserie und eine Dolomit-Kalk-Serie. Unter vielem

Vorbehalt kann man diese Schichtenserien miteinander parallelisieren, jedoch derart, dass die Thule-Formation auf Mylius-Erichsen-Land unzweifelhaft mehr umfasst, als die Quarzitserie der Eleonore-Bay-Formation. Man muss nämlich berücksigtigen, dass die Thule-Formation auf Mylius-Erichsen-Land noch auf dem Plateau liegt, sodass sie in Wirklichkeit den drei Zonen der Eleonore-Bay-Formation entspricht.

Man sieht also, dass in den Gegend um den Danmarks-Fjord sich die Schichten der Thule-Formation nicht mehr nach Norden zu neigen, sondern nach Nordost und Ost. Hier sind sie der Geosynklinale so nahe gekommen, dass eine ganze Reihe Schichten abgelagert werden, erst eine grosse Schieferserie, danach eine Dolomit-Kalksteinserie."

This latter state of affairs is pointed out as a difference from conditions in North Greenland, where a broad plateau, on which unfolded Cambrian and Silurian sediments overlie the sandstones of the Thule Formation, occurs south of the folded range. Here the Thule Formation, only a few hundred metres thick, corresponds to the Eleonore Bay Formation of a thickness of several thousand metres in southern Northeast Greenland.

Later Koch, in a letter to the present author, has expressed a somewhat altered view, writing (June 14th, 1937) (translated from the Danish): "— It is hardly difficult to ascend to the land inside Lynn Ø, and some way up there are entirely level plains stretching inwards. The folded beds soon stop, and then the Thule Formation is probably overlain by Cambro-Silurian beds. Cambrium and Lower Ordovicium will not probably exhibit much more than is already known to us, even though beds in situ are of course of very great importance here.

What would be of special interest, is the development of the Silurian (Gotlandian) strata, since we ..."

On this assumption the difference previously pointed out between the foreland south of the folded range of North Greenland and the foreland west of the folded range of East Greenland must be given up, as the sediments which overlie the Thule Formation on the foreland west of the East Greenland geosyncline are no longer parallelised with the central part of the Eleonore Bay Formation, but with lower Palæozoic deposits.

The latter view agrees excellently with the observations made in the spring of 1939.

During my attempt to reach Danmarks Fjord by travelling across the land from Ingolfs Fjord I had an opportunity to observe a section cutting across the country from about 16° to 22° W. long., that is to say, through the western part of the East Greenland geosyncline and the eastern part of the foreland west of it.

In the outer part of Ingolfs Fjord the coastal mountains are entirely made up of marine, late-Palæozoic deposits. Wegener Øer and various exposures along the north coast of Holms Land west of Maagegletscher consist of gneiss. One receives a distinct impression that the gneiss on Holms Land as also on Amdrups Land forms a very low plateau, whose surface slopes slightly towards the east, and on which the late-Palæozoic sediments are deposited; but the direct contact between the sediments and the gneiss could not be observed in the coast sections of Ingolfs Fjord itself, possibly owing to the very heavy snow-covering in the year in question.

Both on Holms Land and on Amdrups Land the sediments are slightly folded, the folding axes extending almost in the direction north-northeast to south-southwest. Slight foldings have been demonstrated also in late-Palæozoic sediments farther south along the east coast in the area between 70° and 75° N. lat.

In addition the sediments are traversed by rather small faults whose direction is in most cases parallel with a line from the eastern part of Mallemukfjæld to a point about 5 km east of Kap Jungersen.

West of the central firns on Holms Land and Amdrups Land the land is very low, as will appear from the map, so that it will no doubt be possible without any great difficulty to sledge from Ingolfs Fjord southward to Dijmphna Sund through Firndalen and northward through Bagdalen to the inner part of Antarctics Bugt. In the spring of 1939 these low passages, bounded both on the east and west by ice caps or glaciers, were filled with so much snow that it was impossible to make geological observations. Very probably they will not present exposures of fixed rock, even when they are free from snow, but exclusively of morainic material.

The relation between the low gneiss plateau to the east and the alpine mountain region to the west can therefore hardly be investigated in the area around Ingolfs Fjord.

As will be seen from the map, the alpine mountain range is divided by the newly discovered narrow inner part of Ingolfs Fjord, which here extends in a west-northwesterly direction, into Prinsesse Elisabeths Alper to the north and Prinsesse Caroline-Mathildes Alper to the south. The mountains on either side of this part of the fjord consist of very highly metamorphosed sediments, which show traces of intense folding. The beds are traversed everywhere by dark bands often of considerable thickness. With great readiness Professor BØGGILD determined a sample brought home from one of these bands and found it to be amphibolite. Whether the dark bands in the highly metamorphosed sediments within this area have any association with the eruptive activity in the unfolded Thule sandstone near Danmarks Fjord and with the eruptive activity

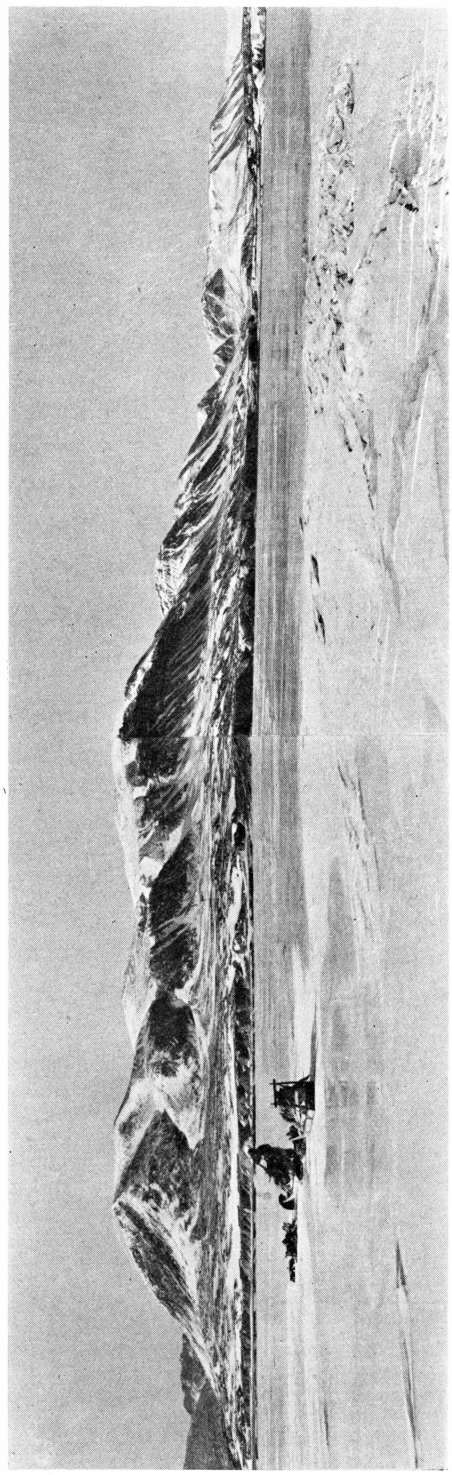

Fig. 1. Kronprins Christians Land seen from the northernmost of the two small inner branches of Ingolfs Fjord. Farthest left Sødalen. Above the sledge Nøglefjældet. To the right the first part of the large valley Vandredalen leading up to Romers Sø.

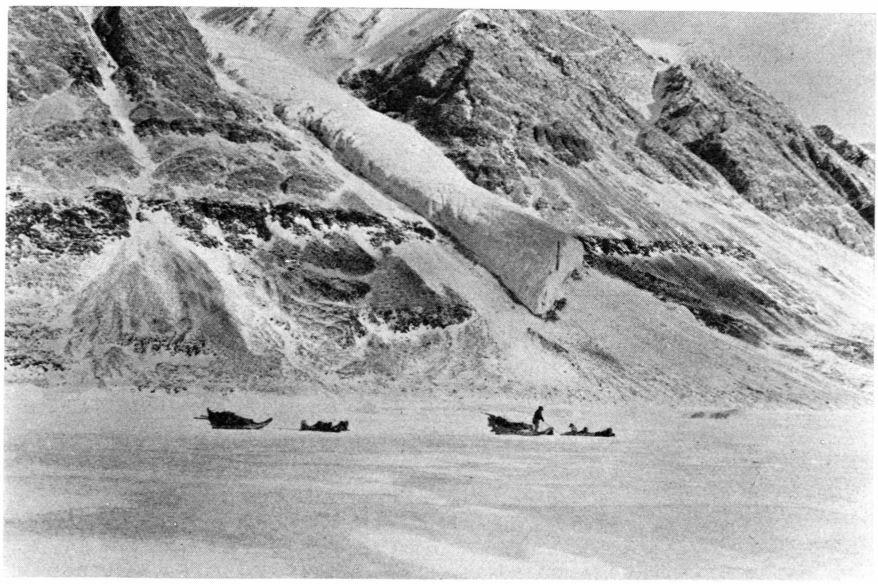

Fig. 2. The northwestern part of Prinsesse Caroline-Mathildes Alper with Draabegletscher. One of the dark bands is very prominent in the lower part of the mountain wall. Its thickness is about 50 m.

on Dronning Louises Land, I am unable to say[1]). Dealing with the eruptive activity that has taken place in the sediments of Dronning Louises Land, KOCH (KOCH 1929, p. 59) mentions an observation made by WEGENER in 1907 of large black blocks at Eskimonæsset on Holms Land, which WEGENER found to resemble the diabases of Dronning Louises Land. If the blocks observed by WEGENER are diabases, they hardly originate from the area of Holms Land or from the land to the west of it, but possibly from Amdrups Land, where olivine diabase crops out in the interior of Antarctics Bugt (according to Professor BØGGILD's determination of a sample brought home).

Immediately after passing the alpine mountain range, the narrow fjord branch bends towards the southwest, extending in that direction almost parallel with the western side of Prinsesse Caroline-Mathildes Alper. On the west this part of the fjord is bounded by some lower folded mountains, Taagefjældene, whose folding axes are parallel with the large valley extending from Romers Sø to Ingolfs Fjord. The folded rocks here consist of limestones, dolomites, and dark shales. The limestones, and especially the dolomites, vary greatly in colour from light-yellow, red, and chocolate-brown to violet and grey, and the mountains

[1]) For the eruptive activity west of Danmarks Fjord, cf. KOCH 1920, p. 28, 1929 a, pp. 56—59, 1929 b, p. 221, 1935 a, 1935 b, 1936. Also BØGGILD 1915, CALLISEN 1929.

bear a very great resemblance to the dolomite-limestone series of the Eleonore Bay Formation which I have seen in the southern part of Northeast Greenland. The possibility cannot at the outset be disregarded that part of this series, at any rate, may be of Cambrian age, but in spite of close investigation of several sections I did not succeed in finding fossils anywhere in the series.

The northernmost of the two small end branches of Ingolfs Fjord intersects the eastern range of these sediments, which are beautifully exposed in Næsen south of the fjord branch, and end immediately west of the delta of the large river issuing from Romers Sø. West of Vandredalen another mountain range is found, parallel with Taagefjældene (see Fig. 1). Only the southernmost mountain in the part of the range situated north of Sødalen, viz. Nøglefjældet, was closely investigated (Fig. 3). The eastern part of this mountain is made up of a huge inverted fold consisting of similar sediments to those met with in Taagefjældene, and whose axis is parallel with the folding axes of the latter. Seen from the east, as in Fig. 1, the mountain therefore conveys an impression of being built up of entirely regular horizontal beds. The western part of the mountain consists of unfolded limestones and shales, and seen from the south, as in Fig. 3, the large inverted fold of the limestone-dolomite series will be seen to have been pressed into and partly across the sediments to the west, so that the central part of the mountain is made up of much disturbed beds of the same sediments which are entirely unfolded in the western part of the mountain.

Thus the western boundary of the fold is very well defined in this area. The folding axes of the mountain ranges bounding Romers Sø on the west and east, and of their continuations to the south, are mutually parallel and parallel with the Romers Sø valley and with the valley extending in continuation of the Romers Sø valley from the southwestern point of the small northern end branch of Ingolfs Fjord. From an altitude of about 600 m I observed that these two folding ranges frame the large valley tract over a stretch of at least 50 km. The regular course of the valley and of Romers Sø (which I have not seen) renders it probable that its direction is dependent on the direction of the folding and thus seems to indicate that the folded limestone-dolomite series continues in the direction of the valley at least 100 km northward from the head of Ingolfs Fjord, as well as a considerable distance towards the south.

After passing the boundary of the folded area, travelling through the almost snow-free Sødalen west of Ingolfs Fjord, I succeeded in pushing about twenty kilometers towards the interior of Kronprins Christians Land partly by means of sledges partly on foot.

In here the narrow, often canyon-like valleys present excellent

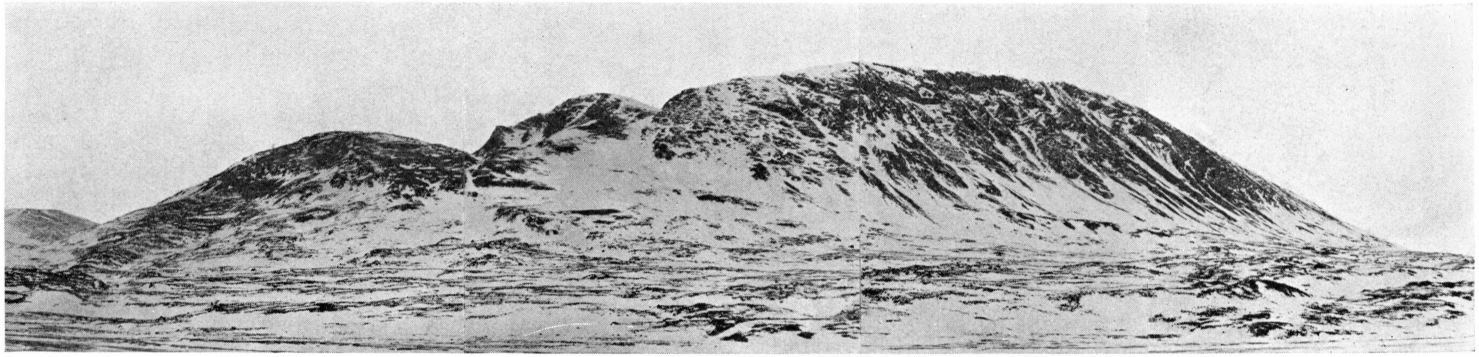

Fig. 3. Nøglefjældet seen from the south. Farthest east, the inverted fold of the limestone-dolomite series. West of this, intensely disturbed limestones and shales are found in the central part of the highest part of the mountain. The western half of the mountain is made up of regular beds of limestone (below) and shales (above).

Fig. 4. Looking from the north side of Sødalen eastward across the inner end of Ingolfs Fjord. In the far background Prinsesse Caroline-Mathildes Alper; to the left of the fjord branch, Taagefjældene, to the right Næsen. In front of Taagefjældene the mouth of the large Vandredalen.

exposures of the dark unfolded sediments, whose presence was ascertained by KOCH from an airplane. The strata are tilted about 5—6 degrees to the east, and as Sødalen, in whose river-bed we travelled, only rises very slightly towards the west over a fairly considerable stretch, we passed constantly deeper zones of the sediments in the river-bed proper the farther we pushed into the valley.

All exposures in the river-bed itself as far as about 18 km from the head of the fjord consisted of dark solid limestones with a fauna rather poor in species but rich in individuals.

Measurements of sections were made in Palisaderne and in Profilfjældet (cf. the map); from an altitude of about 1000 m on the latter mountain we had an excellent view of an extensive area. As far as the eye could reach towards the southwest and northwest, the mountains consisted of the same regular limestone beds as those observed during our journey through Sødalen.

This limestone series consists at the base of 300—400 m very dark limestones bedded in zones 2—20 m thick. Stratification is not visible within the individual beds. Fossils, apparently of the same types, are found throughout the series, but zones rich in individuals alternate with zones in which fossils are sparse. In some zones corals, in particular, predominate, while in other zones the large pentamerids are especially abundant.

Fig. 5. View from Vestfjældet across Sødalen with Troldsøen. On the extreme right Palisaderne. The mountains are made up of limestones of the Offley Island Formation.

The fossiliferous series is overlain by about 150 m of hard limestone of a lighter greyish colour than the subjacent limestone. No fossils were found in it; this is possibly due to the less favourable conditions of preservation, for in the deeper series, too, the fossils are better preserved in the darkest limestone beds, and of very sporadic occurrence and little conspicuous in the lighter-coloured zones.

The substratum of the limestone series at least 500—600 m thick was not observed, but as the beds dip towards the east, they are probably exposed farther westward on Kronprins Christians Land. The limestone series, which builds up the peaks of Palisaderne and the other mountains situated just as far westward, is overlain, on Profilfjældet and Nøglefjældet, by a series about 300—400 m thick. This series begins at the base with a conglomerate 2—4 m thick (in Profilfjældet), whose block diameter rarely exceeds 10 cm and is, as a rule, much smaller. Otherwise the series consists of fine-grained shales, brownish, reddish, or grey, alternating with more sandy beds. In spite of zealous search I failed to find any fossils in this series. In the outer part of the river-valley, immediately west of the delta, a conglomerate, at least 5 m thick, is exposed, but it was impossible to establish its relation to the remaining part of the series. Possibly it belongs to the westernmost part of the folded range, but it is not impossible that it corresponds to the conglomerate intervening between the limestone zone and the

shaly zone in Profilfjældet. However, the average size of its blocks far exceeds that of the Profilfjæld-conglomerate, the largest blocks measuring 25 cm in diameter.

The fossils from the limestone series 300—400 m thick have been examined by Dr. CHR. POULSEN, who has supplied me with the following list:

Stromatopora constellata HALL
Amplexus polaris n. sp.
Streptelasma ? sp.
Favosites favosus (GOLDF.)
— *cf. niagarensis* HALL
— sp.
Halysites sp.
Heliolites sp.
Hogmochilina sp.
Pentameridae and other brachiopods.

According to POULSEN, the *Hogmochilina* material may possibly be determined specifically.

As to the age of the fauna POULSEN informs me that all the identifiable forms are known from the Offley Island Formation of North Greenland, and that *Amplexus polaris* is known from this formation only. Thus there is every probability that the Offley Island Formation is represented here in Kronprins Christians Land.

From the southeastern point of Kronprins Christians Land, Kap Bernhoft, another sledge party of the expedition led by S. SØLVER brought home a loose-lying limestone specimen containing large pentamerids evidently derived from the same formation.

The Offley Island Formation (KOCH 1920, 1929b, 1935, etc.; POULSEN 1934, etc.) in North Greenland "is made up of arenaceous limestone and shales overlain mostly by massive-bedded, cliff-forming limestone of a light colour and very hard. In several localities the pebbles in the basal conglomerate are very large and consist exclusively of limestone" (KOCH 1929b, p. 238). Its thickness is stated to be 500—800 m.

According to POULSEN this very considerable series of strata and the breaks of sedimentation below and above this formation in North Greenland correspond to a single graptolite zone, viz. the zone with *Monograptus sedgwicki* (POULSEN 1934, p. 46).

On the North and East Greenland Geosynclines and their Forelands.

In the above a confirmation has been given of LAUGE KOCH's observations from airplane that a much folded zone is found in the

northeasternmost part of Greenland, and that unfolded sediments of considerable thickness occur in the interior of Kronprins Christians Land west of the folded area.

From the examination of material brought home by the First Thule Expedition (BØGGILD 1915) and from observations made from the air on the Danish Three-Year Expedition it is known that the coast mountains of Danmarks Fjord consist of sandstones belonging to the Thule Formation (KOCH 1935a, p. 11). The Archean mentioned by KOCH in 1920 (observed by EJNAR MIKKELSEN) (KOCH 1920, p. 28) has been omitted on the geological maps of KOCH's recent works (cf. e.g. KOCH 1935a, Fig. 9, and KOCH 1935b, Fig. 4). According to verbal communication from Dr. KOCH to the present author this is a consequence of his observations from the air.

Between the sandstones of the Thule Formation near Danmarks Fjord and the Gotlandian ascertained by myself west of Ingolfs Fjord we may probably expect to find an equally complete Cambrian and Silurian series of strata as in the remaining part of North Greenland.

Judging from findings of boulders (see p. 27), the unfolded sediment zone may be traced southward as far as the area round Nioghalvfjerdsfjorden; farther south, if present, it is entirely covered by the inland ice, as it should be situated west of the folded area. These unfolded sediments, which were ascertained on Kronprins Christians Land, and which have possibly a wide distribution southward, must be regarded as deposited on the foreland of the East Greenland geosyncline in the same way as the corresponding unfolded sediments in the western part of North Greenland, that is to say, on a pre-Cambrian eroded surface of the ancient bed-rock of Greenland.

The northern part of the East Greenland folded zone, and possibly the southern part, too, do not, therefore, present the contrast to the North Greenland folded zone pointed out by KOCH when he says: "In contrast to the East Greenland mountain range, the North Greenland range is separated from the central gneiss block by a broad plateau" (KOCH 1935b, p. 618).

No proof is available to show that the North Greenland geosyncline and the East Greenland geosyncline meet at an acute angle in the sea between northernmost Greenland and Spitsbergen, as suggested by KOCH (1936, p. 17, Fig. 2; further 1935a, Fig. 9, and 1935b, Fig. 4); Nakkehoved is not, as assumed by KOCH, the last offshoot of the East Greenland mountain range. In the letter mentioned p. 17, however, KOCH points out that Nakkehoved is made up of sediments, probably of Permian age. It may therefore just as well be assumed that the two geosynclines meet at right angles north of Kronprins Christians Land, or, what I should consider probable, that the East Greenland geo-

syncline follows the shape of the Greenland block and therefore swerves westward in an even curve and has its direct continuation in the North Greenland geosyncline.

The Offley Island Formation of North Greenland was deposited after a break of sedimentation with upheaval of the land and erosion (KOCH 1935a, pp. 134—135; and 1929a, 1929b, etc.); after the deposition of the formation a very considerable upheaval of the land took place (at least 600 m) succeeded by strong erosion, after which the Cape Tyson Formation was deposited during another subsidence and sedimentation. From this KOCH concludes that strong taconic movements have taken place in North Greenland; he says (KOCH 1935a, p. 47) that probably the Caledonian main folding in East Greenland took place at the same time as these movements, and this he thinks will account for the complete absence of the Offley Island Formation in Northeast Greenland (Peary Land).

According to the above it seems beyond doubt that a phase of the folding in East Greenland did not take place till after the deposition of the Offley Island Formation, but prior to the deposition of the Dinantian.

Whether movements corresponding to those ascertained in North Greenland have taken place to the same extent in Kronprins Christians Land, cannot yet be decided, the lower limit of the Offley Island Formation not having been observed; however, the conglomerate overlying the formation possibly points in that direction.

Thus there may have been movements in the northern part of the East Greenland geosyncline even at this time; but probably the abovementioned folding should be parallelised vith one of the Devonian foldings found by BÜTLER farther south in East Greenland.

Observations on Morainic Boulders between 77° and 82° N. lat.

On my journeys along the east coast between Germania Land and Nakkehoved I now and then had an opportunity of examining the erratic boulders in the moraines. Along the whole east coast of Greenland as far as 81° N. lat. red, grey, and whitish quartzites are of fairly frequent occurrence, and dolomites of various colours are likewise found in many places — types of rock evidently originating from a similar formation as the aforementioned folded sediments in the interior of Ingolfs Fjord. *Scolithus* sandstone is rare; but I observed some few specimens on Germania Land and one on Schnauders Ø. Boulders, up to one metre in diameter, of a conglomerate bearing a great resemblance to the conglomerate found *in situ* near the delta at the head

of Ingolfs Fjord (see p. 24) were observed on Hovgaards Ø, a small island in Jøkelbugten (Hammeren), and on Germania Land. I should like to say, however, that if I found such conglomerate blocks in the area between 70° and 75° N. lat., I should not hesitate to determine them as derived from Devonian or Carboniferous conglomerates, to which they bear a deceptive resemblance.

On Norske Øer KOCH (KOCH 1935a, p. 24, 1935b, p. 617) found loose-lying boulders partly of Cambrian age and partly representing all three divisions of the Eleonore Bay Formation. All these finds of boulders support the supposition that the formations ascertained in the interior of Ingolfs Fjord continue southward.

North of Antarctics Bugt the glacier front extends right out to the sea along a considerable stretch of the coast, and wherever coast-land is found there was no good opportunity of examining the morainic material on the journey in 1939 since practically all land was covered with new-fallen snow.

Thus on the return journey I did not observe a single stone free from snow along the whole coast of Kilen. But on the low coast-land some distance farther northward, the easternmost part of Greenland, made up exclusively of morainic material, I examined the moraines in several localities in order to try to find specimens of similar fossiliferous sediments to those predominant on Amdrups Land and Holms Land; to my surprise I found no such rocks represented, whereas sandstones of the same types occurred as those I found later on *in situ* in the area of Nakkehoved.

On the Danmark Expedition loose-lying boulders belonging to Portlandian and Neocomian were found on Germania Land in the neighbourhood of Danmarks Havn (J. P. J. RAVN 1911, pp. 445—46). Such boulders were not observed farther westward on Germania Land in the area around the station of Mørkefjord.

Nakkehoved.

Nakkehoved is a mountainous area up to 300 m high which constitutes the westernmost part of Erik S. Henius Land. It consists of a narrow strip of land along the coast and a number of small nunataks, and only on account of its considerable altitude in relation to the surrounding area has it escaped concealment beneath the ice-cap, which reaches the sea both southeast and west of Nakkehoved.

In the report of the Danmark Expedition AMDRUP (AMDRUP 1913, p. 122) mentions "the gneiss hills in Erik S. Henius Land". The whole visible portion of the area of Nakkehoved is made up of sediments, as previously recorded by BØGGILD. However, according to verbal com-

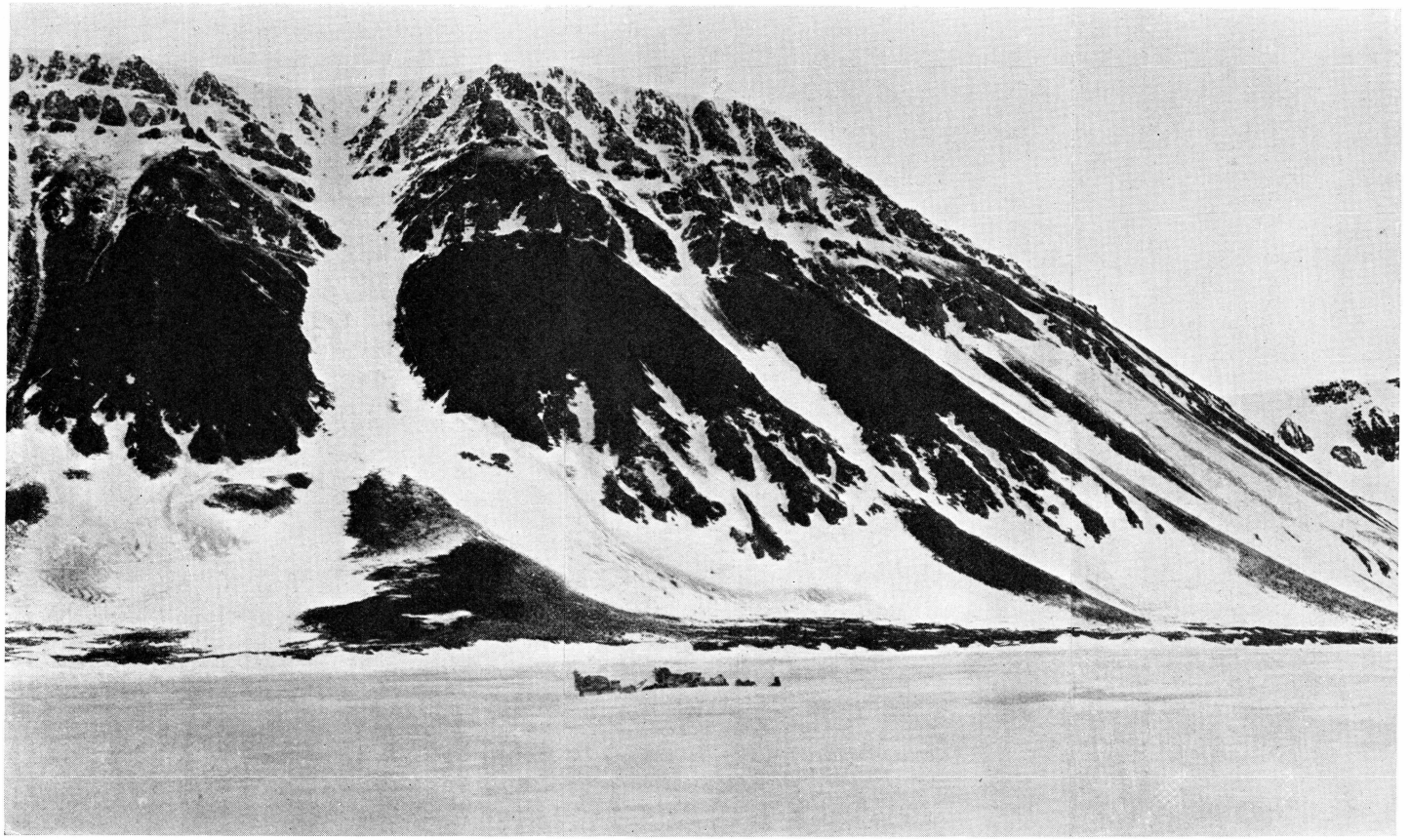

Fig. 6. Nakkehoved seen from the sea-ice towards the place where the western section was measured. The height of the mountain is about 300 m.

munication from Prof. BØGGILD to the present author, no samples are at hand from the Danmark Expedition.

The beds, which consist of dark sandstones, dip 14 degrees to the southwest.

I measured two sections, one in one of the eastern nunataks and one in the place where the land is highest.

I had expected beforehand to find fossiliferous Palæozoic formations of a type similar to those observed between 80° and 81° N. lat., but I was surprised to be confronted with a formation containing very few fossils, which were moreover only preserved as moulds and casts.

I measured the easternmost of the two sections in one of the small mountain peaks in the eastern part of the area (peak No. 2 from the east on the map), which reaches an altitude of about 200 m.

Altitude ca. 200—170 m	Very dark, almost black, hard sandstones without fossils.
170— 69 -	Débris of dark-grey sandstone, whose weathered surface are often of a lighter greyish colour. Some of the loose blocks contained mussels in a poor state of preservation.
69— 64 -	Very dark hard sandstones, the weathered surfaces grey or brownish. No fossils.
64— 52 -	Sandstone similar to the superjacent one, but with fairly frequent remains of mussels. In addition a single gastropod and frequent specimens of a fossil suggestive of *Ophiomorpha*.
Below 52 -	Morainic material.

A few days later a section was measured immediately east of the very small glacier in the western part of the Nakkehoved area. In this place Nakkehoved attains its greatest height: c. 300 m, and the sediments here were much better exposed than in the preceding section. The section consists throughout (from 22 to c. 300 m) of dark sandstones resembling those observed in the eastern section, and presents a constant alternation of light-grey to quite black sandstone beds, whose thickness varies from 10 to 30 m. Fossils were nowhere found within this very uniform section.

Of the fossils found in the eastern section some lamellibranchs were brought home, which Docent J. P. J. RAVN very kindly undertook to examine. Owing to the state of preservation of the material only the following list could be erected:

Yoldia sp.
Nucula sp.
Barbatia sp.

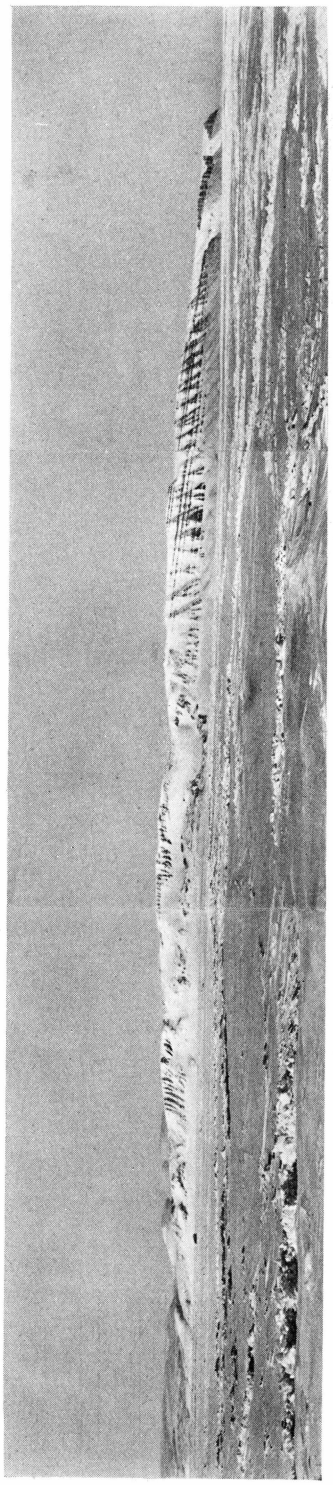

Fig. 7. The southeastern part of Holms Land seen from an iceberg in the mouth of Dijmphna Sund. Farthest east, Mallemukfjæld, west of it Depotfjældet with its characteristic alternation of beds of different colour and hardness. West of Depotfjældet, Sortebakker.

According to RAVN, this list indicates Cretaceous or Tertiary, the latter being perhaps the most likely.

Sediments of so young an age have not previously been found in the northern part of Greenland. In this connection I may mention, however, that light-coloured fossiliferous sediments were observed by EJNAR MIKKELSEN west of the interior of Danmarks Fjord in 1910 (EJNAR MIKKELSEN 1922, p. 81). Unfortunately EJNAR MIKKELSEN's

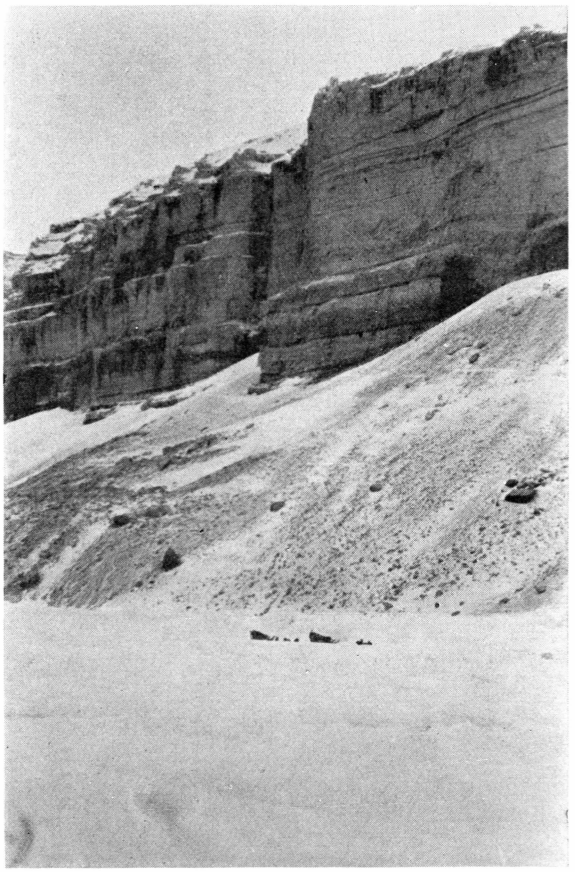

Fig. 8. Mallemukfjæld.

collections were lost during the journey, so it is impossible to say anything about the age of these fossils.

Some Preliminary Remarks on the Sediments on Holms Land and Amdrups Land.

Since it is impossible at present to have any idea when the final description of the late-Palæozoic sediments and their fauna will be

available, among other things because it will be of importance to await the working up of the material from the more southerly parts of the east coast of Greenland now in progress, I take this opportunity to mention a couple of preliminary results of the investigation of the area between 80° and 81° N. lat.

The marine sediments of the southeastern part of Holms Land were investigated in a number of sections, which, combined, comprise

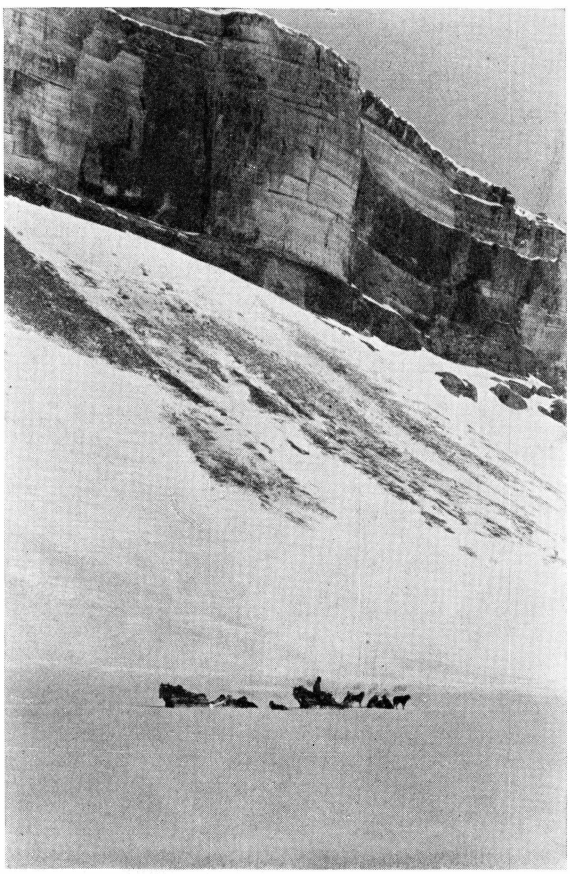

Fig. 9. The coastal mountain at Kap Jungersen.

the whole marine series except the youngest beds of Mallemukfjæld, which are absolutely inaccessible in April and May. These youngest sediments were therefore investigated in the less steep Maagefjæld in the northeastern part of Holms Land.

The complete section on Holms Land through the marine sedimentary series about 700 m thick shows two breaks of sedimentation with drainage of the area and a subsequent transgression. How long the periods are which are represented by each of the two breaks of

sedimentation, cannot be decided until the determinations of the fossils are available.

On Amdrups Land, too, the thickness of the marine sediments was estimated at about 700 m, by a combination of several sections. But the sediments within the two areas are not easy to parallelise, as they seem to differ in various respects. No certain breaks of sedimentation are known, but two zones with typical shallow-water sediments seem to correspond to the two breaks of sedimentation on Holms Land.

On the whole the section on Amdrups Land seems to comprise a somewhat longer period, both upwards and downwards, than the Holms Land section, which is indicative of the same thing as the breaks of sedimentation, namely that the Holms Land area has altogether been more high-lying than the Amdrups Land area, so that it was the first to be drained by regressions of the sea and the last to be flooded by transgressions of the sea.

In addition to the considerable material of invertebrates, as regards which special importance was attached to the *Foraminifera*, I succeeded in finding a number of bradyodont and pleurodont shark teeth of types not previously known from Greenland.

As regards the continental Carboniferous, it is exceedingly uniformly built up, with a constant alternation of sandstones and shales. In Sortebakkerne, made up exclusively of continental Carboniferous deposits, a considerable number of coal beds up to half a metre thick were found; they would no doubt be of importance for a travelling party in an emergency.

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NORDÖSTGRÖNLAND

fra 79°45' til 82°n. Br.

Map-sketch made by the Danish Northeastgreenland Expedition and the Drastrup Expedition 1938-39 on the basis of existing maps.